

# A New and Some Little Known Species of *Eporibatula* (Acari: Oribatida: Oribatulidae), with Remarks on Taxonomy of the Genus

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**ABSTRACT**—A new species of oribatid mite belonging to the genus *Eporibatula* Sellnick is described from litter of larch plantation in Mt. Yatsugatake, Yamanashi Prefecture, Central Japan. The new species, *Eporibatula variabilis* sp. nov. differs from other species of the genus by the presence of ten pairs of notogastral setae, the short median and posterior notogastral setae, the wide lamellae, the well-developed humeral projection, and the weakly arched dorsosejugal suture. Two known species, *E. tuberosa* Fujikawa, 1972 and *E. prominens* Bayartogtokh et Aoki, 1998 from Japan and Mongolia, respectively are redescribed. In addition a revised diagnosis of the genus *Eporibatula* is proposed, and the taxonomic problems of some species belonging to this genus are discussed. The following new combinations are proposed: *Eporibatula venusta* (Berlese, 1908) comb. nov. and *Eporibatula sakamorii* (Aoki, 1970) comb. nov. A key to the known species of the genus *Eporibatula* is given.

## INTRODUCTION

The oribatid mite genus *Eporibatula* was proposed by Sellnick (1928) with *Eremaeus rauschenensis* Sellnick, 1908 as the type species. The family-group placement of *Eporibatula* has been uncertain. Sellnick (1928) considered *Eporibatula* as a member of the family Notaspididae Oudemans. Subsequently, Willmann (1931) included this genus in the family Oribatulidae Thor. Grandjean (1933) proposed the family Scheloribatidae, to encompass four genera, namely: *Dryobates* Grandjean, *Eporibatula* Sellnick, *Scheloribates* Berlese and *Liebstadia* Oudemans, and distinguished the family from Oribatulidae. Later, Grandjean (1949, 1950, 1953a) repeatedly defined the family Scheloribatidae including *Eporibatula* upon the basis of characters of both adults and immature. However, in his more subsequent definition of Scheloribatidae and Oribatulidae, Grandjean (1958) considered that *Eporibatula* is not a member of Scheloribatidae, and he mentioned that this genus should belong to the family Oribatulidae.

In his early treatises on oribatid mite genera Balogh (1961, 1963, 1965, 1972) included this genus in the family Oribatulidae Thor. Several other authors had the same opinion and they followed the latter classification system (Aoki, 1964; Coetzer, 1968; Fujikawa, 1972; Bulanova-Zachvatkina, 1975). Moreover, in the recent classification of Oripodoidea,

Balogh and Balogh (1984, 1992), and Wunderle *et al.* (1990) considered *Eporibatula* as a member of Oribatulidae. In this paper we have followed the above mentioned authors' concept.

*Eporibatula* is a small genus of oribatid mites and, until the present work, only 12 species were originally included in this genus. The representatives of this genus seem to be relatively rare and most of the known species have been described only from the Palaearctic (Sellnick, 1908, 1931; Willmann, 1932; Mihelčič, 1956; Schweizer, 1956; Fujikawa, 1972; Pérez-Iñigo, 1976; Bayartogtokh and Aoki, 1998), Nearctic (Banks, 1904) and Neotropical regions (Hammer, 1958, 1962). The geographic distribution of *Eporibatula* includes Europe, Central and East Asia, and South and North America. According to the present data, only the type-species, *E. rauschenensis* is distributed over the whole European continent. Most other species seem to be distributed only in restricted areas or are known only from the type localities.

The fully acceptable diagnosis of *Eporibatula* was not available before, and there were several different interpretations of this genus. When he proposed this genus, Sellnick (1928) stated the following characters as diagnostic for the genus: lamellae almost linear; translamella absent; pteromorphae not projecting over the outline of hysterosoma; lamellar and interlamellar setae, and a pair of shoulder setae stronger than the others; pseudostigmatic organ pear-shaped and almost spherical, with short stalk; areae porosae present; each side of hysterosoma bearing two long rows and one marginal distinct row of setae; tarsi with three claws.

Balogh (1961, 1963) defined this genus on the bases of

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the following features: without translamella; hysterosoma very long, more than twice as long as wide; notogaster with true areae porosae and 13 or 14 pairs of hairs; scapular hair longer than other dorsal hairs; legs tridactylous. Subsequently, Aoki (1964) defined this genus as follows: dorsosejugal suture convex; true areae porosae present on the notogaster; 14 pairs of notogastral setae; two pairs of scapular setae thicker than the remaining notogastral setae. However, in his subsequent work, Balogh (1965) divided the present genus into two groups. He stated that the first group of *Eporibatula* species has 13 or 14 pairs of notogastral setae and tridactylous tarsi, and the second group bearing 10 or 11 pairs of notogastral setae and monodactylous tarsi. In his more recent work on the oribatid mite genera, Balogh (1972) diagnosed the genus as follows: dorsosejugal suture interrupted medially; 12–14 pairs of notogastral setae; 4 pairs of genital setae; legs tridactylous. In the widely used work of Russian oribatid mites, Bulanova-Zachvatkina (1975) suggested following characters for definition of *Eporibatula*: lamellae thin and linear, not connected with bothridia; dorsosejugal suture interrupted medially, and bothridial scale concealed under the humeral projection. In the meanwhile, in the recent review of Oripodoidea Balogh and Balogh (1984, 1992) considered that the genus bears the following combination of characters: lamellae linear or absent; without translamellar line; dorsosejugal suture continuous; notogaster with 11–14 pairs of setae; two pairs of humeral setae thicker than remaining notogastral setae; genital plates with 4 pairs of setae; legs tridactylous.

The presence of one or two pairs of thick humeral setae is regarded as a specific and apomorphic character of the genus *Eporibatula*. Only this character is not developed in any other genera of Oripodoidea. The other characters, such as number of notogastral and genital setae, shape of lamellae and sensilli, presence or absence of dorsosejugal suture and shape of humeral projections are of less diagnostic value and obviously often developed convergently in some different genera of the family Oribatulidae (*Oribatula*, *Phauloppia*, *Subphauloppia*, *Gerloubia* etc.).

Only two species bearing thick humeral setae have been originally included before in the genus *Oribatula*, but we discussed the taxonomic status of those species (see below and discussion).

**Generic diagnosis of *Eporibatula*:** Oribatulids, adults small to large in size (270–768  $\mu\text{m}$  in length); lamellae mostly narrow, rarely very broad, but sometimes incompletely developed or absent; translamella absent; head of sensilli clavate or capitate, rarely lanceolate, but neither fusiform nor setiform in shape; notogaster with 10 to 14 pairs of setae; one or two pairs of humeral setae thicker than the others, sometimes these humeral setae distinctly longer or shorter than other notogastral setae; 4 pairs of true areae porosae; humeral projection mostly absent, but rarely well developed; four pairs of genital setae; legs tridactylous.

According to the above diagnosis the following two species should be included in this genus: *Oribatula venusta* Berlese, 1908 and *Oribatula sakamorii* Aoki, 1970, since they

have the typical characters of *Eporibatula*. Several other species, which were originally included in *Eporibatula*, cannot belong to this genus. However, the original descriptions of most *Eporibatula* species are inadequate and, therefore, it is very difficult to determine the exact generic placement of each species (see discussion).

Specific terminology used in this paper based on that developed by Grandjean (1950, 1953b, 1958). All measurements are given in micrometers ( $\mu\text{m}$ ), and the average measurement value is given in brackets after the range.

## DESCRIPTION

### *Eporibatula variabilis* sp. nov.

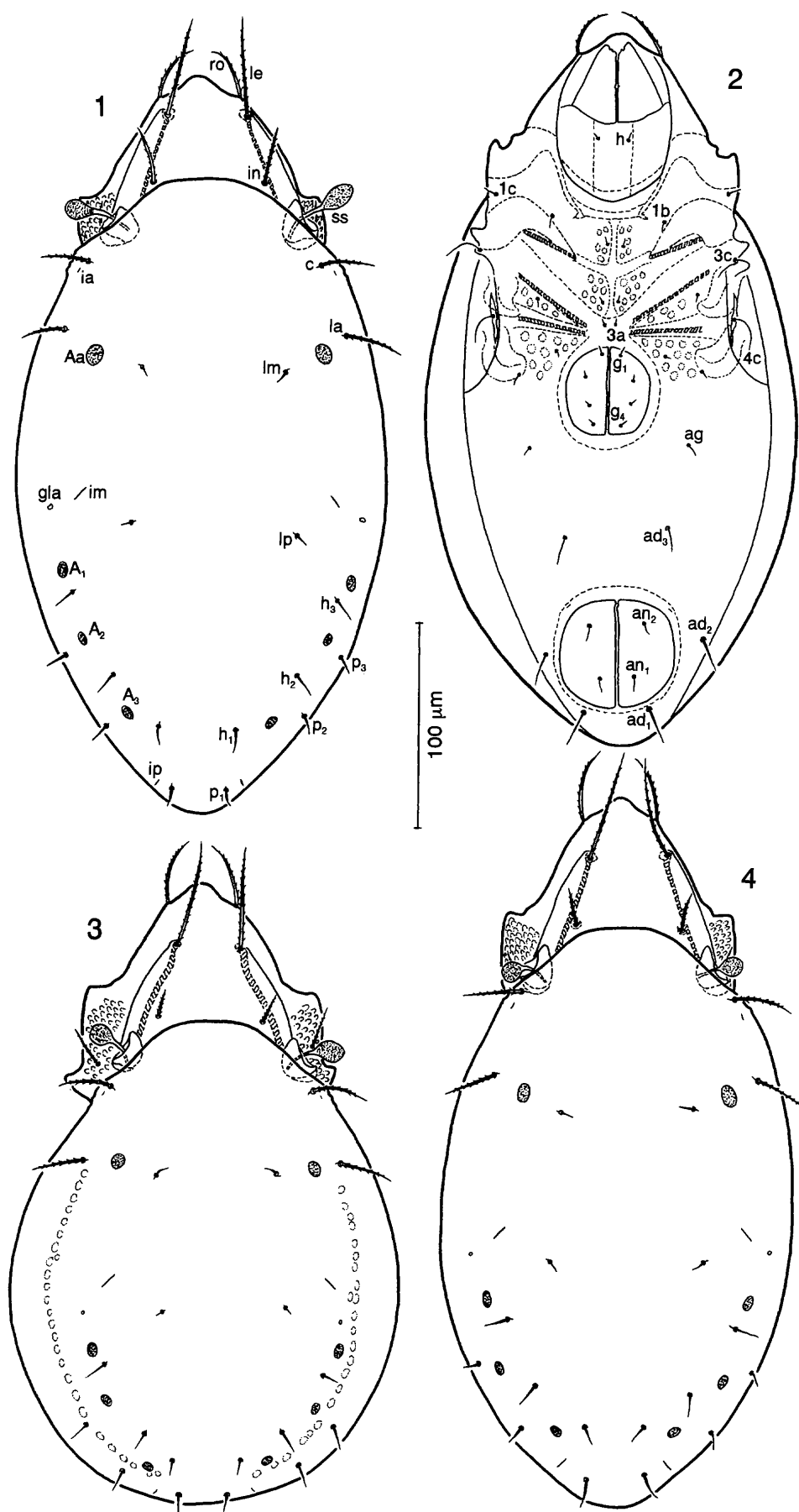
(Figs. 1–10)

**Diagnosis:** The following combination of characters should be regarded as diagnostic for this species: Medium in size, hysterosoma relatively flat in lateral view; rostrum slightly protruding, broadly rounded anteriorly; lamellae relatively wide; sublamellae well developed, reaching posteriorly to the areae porosae *Al*; interlamellar setae rather thick, but relatively short; sensilli with clavate to elongate oval head with internal granular structure; ten pairs of notogastral setae, humeral setae *c* and *la* much longer and thicker than others, distinctly barbed bilaterally, remaining notogastral setae thin and smooth; humeral projection weakly developed, outer margin with one or a few undulations; legs tridactylous.

**Measurements:** Body length 301–354 (322.6)  $\mu\text{m}$ ; length of proterosoma 61–85 (71.0)  $\mu\text{m}$ ; width of proterosoma 120–130 (123.7)  $\mu\text{m}$ ; length of hysterosoma 219–293 (251.8)  $\mu\text{m}$ ; width of hysterosoma 179–200 (192.3)  $\mu\text{m}$ .

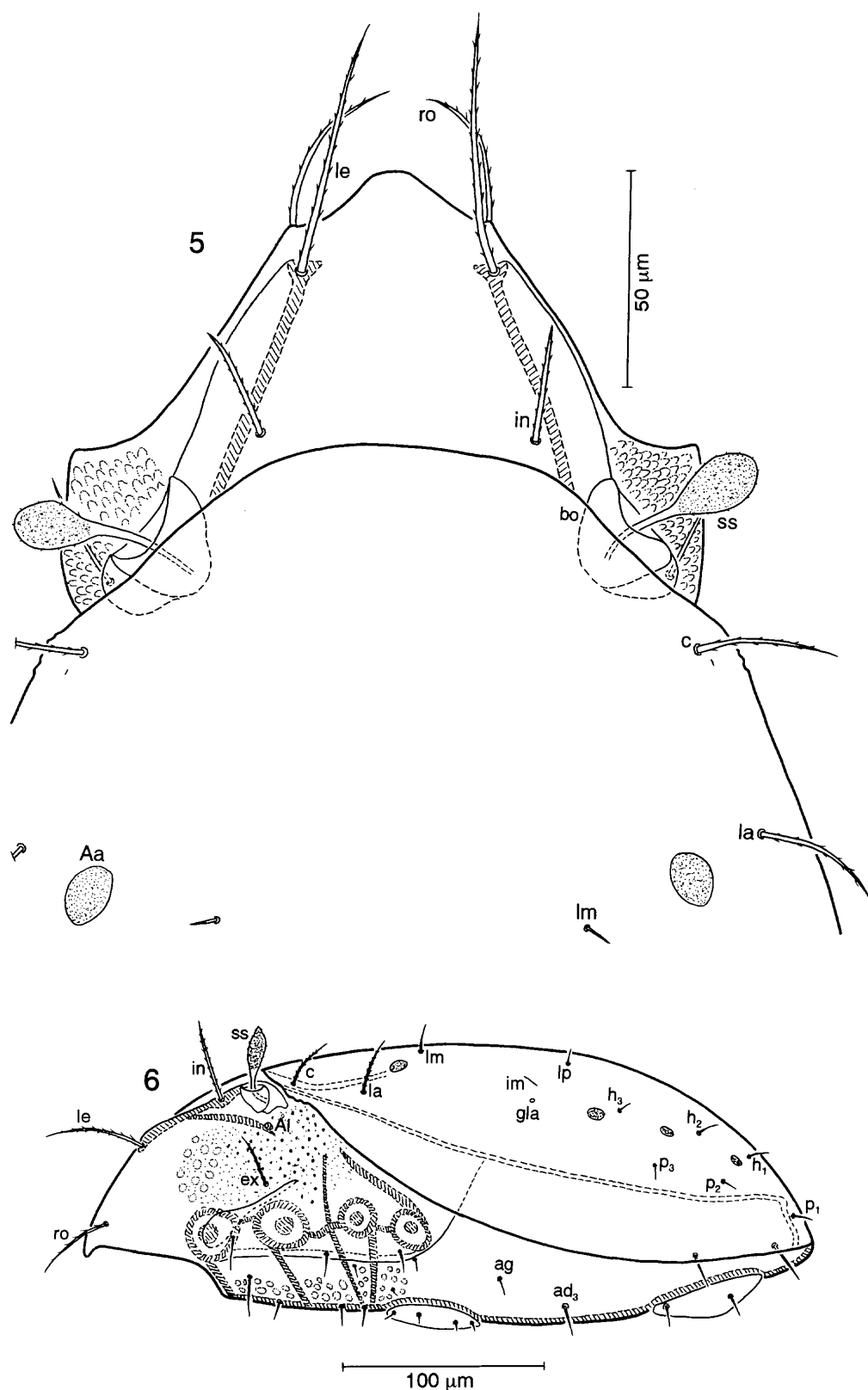
**Integument:** Yellowish-brown in colour. Cerotegument rather thick, being present in very small granules. Exobothridial region tuberculated; lateral region of podosoma with small to medium sized, densely scattered granules. Integument nearly smooth.

**Prodorsum:** More or less triangular in shape, its dorsal surface smooth. Rostrum slightly protruding, but broadly rounded anteriorly. Rostral setae (*ro*) fairly long, conspicuously barbed unilaterally; they are inserted laterally each on a distinct apophysis, extending well beyond the tip of rostrum. Lamellae relatively wide, slightly narrowed distally. Translamella absent; sublamellae well developed. Lamellar setae (*le*) fairly long and thick, longer than rostral ones, conspicuously barbed bilaterally, and extending well beyond the tip of rostrum. Interlamellar setae (*in*) rather thick, but short, shorter than rostral setae, not reaching to the anterior end of lamellae (Figs. 1, 3–6). The length of interlamellar setae somewhat variable. They are inserted very close to the median margin of each lamella. In dorsal view, head of sensillus clavate to capitate in shape, with a short, narrow stalk. Head of sensillus with internal granular structure. Bothridium rather large, posterior scale of bothridium well developed, its posterior part concealed by



**Figs. 1–4.** *Eporibatula variabilis* sp. nov.

1. Dorsal aspect (holotype); 2. Ventral aspect (holotype); 3. Dorsal aspect (paratype, non-typical form, showing the variation of notogaster).  
4. Dorsal aspect (paratype, typical form, showing the variation of sensilli, interlamellar setae and arrangement of notogastral setae).

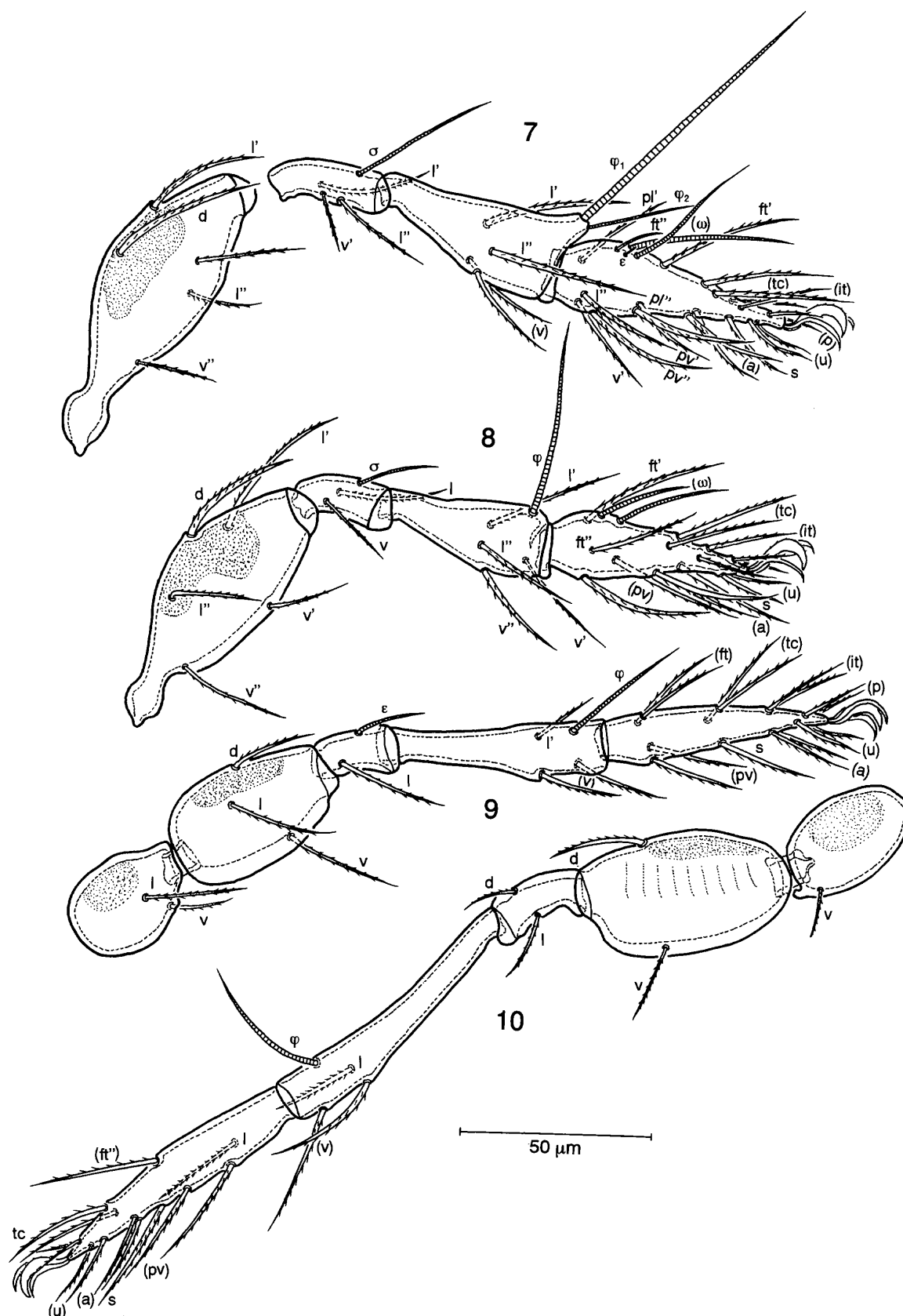
Figs. 5–6. *Eporibatula variabilis* sp. nov.

5. Prodorsum and anterior part of notogaster; 6. Lateral aspect.

anterior margin of notogaster (Figs. 1, 3–5).

**Notogaster:** Shape of notogaster much variable (Figs. 1, 3 and 4), elongate oval to rounded oval in dorsal aspect, but distinctly longer than wide, ratio of width to length 1:1.2–1.6. Numerous muscle sigillae scattered along the lateral and pos-

terolateral margins of notogaster. Dorsosejugal suture complete, conspicuously arched anteriorly. Humeral projection weakly developed, lateral margin of humeral region slightly undulated or serrated (with one to four serration). Ten pairs of notogastral setae; humeral setae *c* and *la* distinctly barbed, much thicker and longer than other notogastral setae.



**Figs. 7–10.** *Eporibatula variabilis* sp. nov.

7. Leg I, trochanter removed (right, antiaxial aspect); 8. Leg II, trochanter removed (right, antiaxial aspect); 9. Leg III (left, paraxial aspect); 10. Leg IV (right, paraxial aspect).

Remaining notogastral setae smooth, thin, medium in length, nearly equal to one another. Four pairs of areae porosae clearly porose and rounded oval (Figs. 1, 3–5). Area porosa Aa situated anterolateral to seta *lm*; A<sub>1</sub> anterolateral to seta *h*<sub>3</sub>, A<sub>2</sub>

anteromedial of seta *p*<sub>3</sub> and A<sub>3</sub> situated between setae *h*<sub>1</sub> and *p*<sub>2</sub>. Lyrifissures *ia*, *im* and *ip* well developed, while *ih* and *ips* inconspicuous; *ia* situated posterolateral to insertion of seta *c*, *im* anterolateral to setae *lp* and *ip* situated lateral to setae

$p_1$ . Latero-opisthosomal gland opening *gla* situated postero-lateral to *im* (Figs. 1, 3–5).

**Lateral aspect:** Relatively flat in lateral view, dorso-ventral thickness of hysterosoma in postgenital transect 133–153 (138.8)  $\mu\text{m}$ . Rostrum distinctly projected anteroventrad. Exobothridial region and lateral part of podosoma granulated. A few muscle sigillae visible between lamella and pedotectum I. Lamellae relatively narrow, slightly widened anteriorly; sublamellae well developed, reaching posteriorly to the level of sublamellar areae porosae *Al*. Sensillus (ss) elongate oval in lateral view, and its head slightly narrowed distally. Exobothridial setae (*ex*) rather long, weakly barbed bilaterally. Carina circumpedalis rather long, reaching to the lateral margin of ventral plate (Fig. 6).

**Gnathosoma:** Subcapitulum, chelicerae and palps normal for the genus. General character and setal arrangement similar to that of type-species, *E. rauschenensis* (Sellnick, 1908), redescribed by Wunderle *et al.* (1990). Palpal setation: 0-2-1-3-10 including both ventral setae and solenidion  $\omega$  of tarsus. Hypostomal surface smooth, one pair of short, thin hypostomal setae *h* visible (Fig. 2).

**Epimeral region:** Epimeral region with a number of round muscle sigillae. Apodemata *apo.2*, *apo.sj* and *apo.3* well developed, rather long, but very thin. Most of epimeral setae very short and thin, only setae *3c* and *4c* rather long, but slender; seta *1c* slightly longer than remaining setae. Setal formula of epimerata: 3-1-3-3. Discidium relatively short and narrow, epimeral seta *4c* inserted on it. Carina circumpedalis well developed, reaching to the lateral border of ventral plate. Pedotectum I large, its surface smooth; pedotectum II scale-like, relatively small (Fig. 2).

**Ano-genital region:** Surface of ventral plate, and both anal and genital plates smooth. Anal and genital apertures situated far from each other, the former being a little longer and wider than the latter. Four pairs of genital setae very short; one pair of aggenital setae slightly longer than the formers. Distance between bases of aggenital setae very long, scarcely longer than that between setae *ad*<sub>2</sub>-*ad*<sub>2</sub>. Two pairs of anal setae, nearly as long as genital setae, and three pairs of very long adanal setae. Seta *ad*<sub>3</sub> situated in preanal position; setae *ad*<sub>1</sub> and *ad*<sub>2</sub> conspicuously longer and thicker than the former one. Paired adanal lyrifissure *iad* very small, situated adjacent and parallel to the anterolateral margin of anal aperture (Fig. 2).

**Legs:** All tarsi heterotridactylous, with lateral claws much thinner than empodial claw; dorsal surface of median claw with a few serrations, and lateral ones smooth. Tarsus and tibia I stronger than those of other legs; tarsi and tibiae III and IV very slender. Tarsus and tibia IV distinctly longer than those of the other legs. Genua I and IV slightly longer than the others. Femur III far shorter than those of the other legs. Length

measurements of each podomere of legs are shown in Table 1. Femora I–IV with very poorly developed ventral keels or blades. Femora I–IV and trochantera III and IV with large areae porosae, and femur IV with distinct striations. Genua, tibiae and tarsi have no areae porosae. Trochanter IV with a distinct anteroventral projection in front of seta *v'*. All leg setae distinctly barbed, except only *ft''* of tarsus I. On tarsus I solenidia  $\omega_1$  and  $\omega_2$  almost equal in length; famulus  $\epsilon$  very short and slender. Tibia I with a distinctly projected apophysis for solenidia;  $\phi_1$  much longer and thicker than  $\phi_2$ . Genu I with a thin and medium long solenidion  $\sigma$ . Dorsal seta *d* located in proximal third of femur I. Solenidia  $\omega_1$  and  $\omega_2$  on tarsus II setiform, the latter slightly longer than the former. Tibia II without crispin for solenidion, and the tibial solenidion  $\phi$  nearly as long as  $\omega_1$  of tarsus I. The formula of leg setation (including famulus): I (1-5-3-4-20); II (1-5-2-4-15); III (2-3-1-3-15); IV (1-2-2-3-13); the formula of solenidia: I (1-2-2); II (1-1-2); III (1-1-0); IV (0-1-0). Setation of legs I–IV as shown in Figs. 7–10.

**Table 1.** Average length ( $\mu\text{m}$ ) of the leg podomeres of *Eporibatula variabilis* sp. nov.

Legs	Trochanter	Femur	Genu	Tibia	Tarsus
I	—	62.75	22.59	40.16	52.71
II	—	60.24	18.82	36.39	48.94
III	22.59	35.14	16.31	45.18	50.20
IV	30.12	45.18	20.08	62.75	61.49

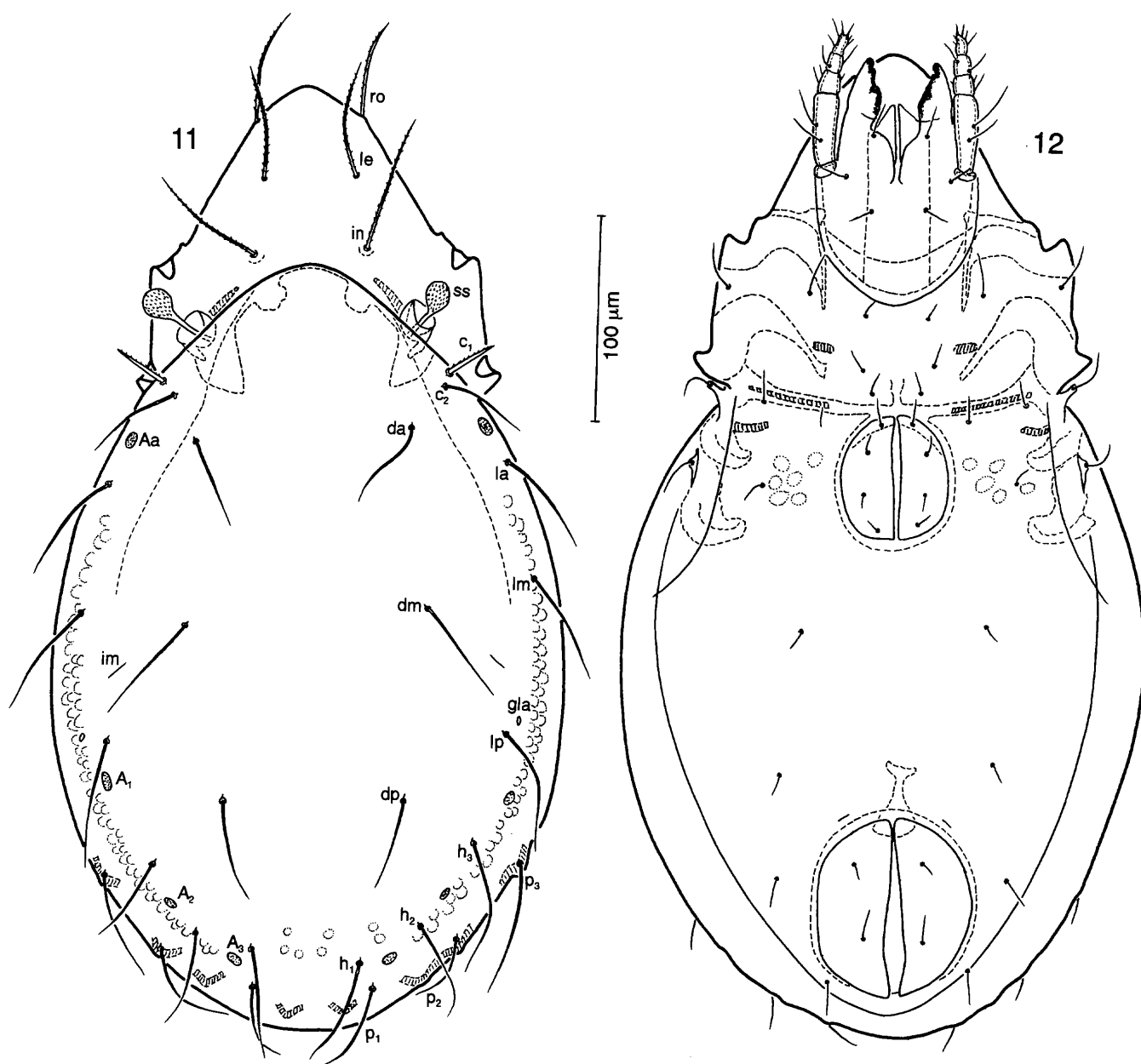
**Variations:** In the studied specimens the following variations in morphological characters were noted. The shape and size of notogaster are much variable. Most specimens has very long and relatively narrow notogaster with narrowly projected posterior part (260–293  $\mu\text{m}$  in length, 178–193  $\mu\text{m}$  in width) as shown in Figs. 1 and 4, while one specimen (non-typical form) bearing relatively wide, but short notogaster (219  $\mu\text{m}$  in length, 200  $\mu\text{m}$  in width), the posterior part of which is widely rounded (Fig. 3). The shape of sensilli is variable from capitate, clavate to elongate oval in shape (Figs. 1, 3–6). Sensillus seems to have a strongly swollen head in usual dorsal aspect, because it is almost straightly standing up, but real shape of the sensillar head in lateral aspect is round oval to elongate oval, and distal end is slightly narrowed. The interlamellar setae also varied from short (10  $\mu\text{m}$ ) to rather long size (27  $\mu\text{m}$ ) as shown in Figs. 1, 3 and 4. Lateral margin of humeral region usually with three to four undulations, but one specimen has only one undulation (Figs. 1 and 3–5). Another variation was observed in dorso-ventral thickness of hysterosoma. The dorso-ventral thickness of typical form in postgenital transect varied 130–133  $\mu\text{m}$ , while the respective size of non-typical form is more greater than the former one (153.1  $\mu\text{m}$ ).

**Material examined:** Holotype: from litter of larch plantation (*Larix kaempferi*), Mt. “Yatsugatake”, Yamanashi Prefecture, 36°56' N., 138°25' E., 1520 m. Three paratypes: same data as holotype. Leg. B. Bayartogtokh, 05-XI-1999. The holotype

and paratypes are deposited in the Acarology collection of the National Science Museum, Tokyo.

**Remarks:** The new species can readily be distinguished from most other known congeneric species by the presence of ten pairs of notogastral setae. Among the known species of *Eporibatula*, only *E. nodifer* Mihelčič, 1956, described from Spain, *E. gracilis* Hammer, 1958, described from Bolivia, and *E. australis* Hammer, 1962, described from Chile, share this trait. However, *E. variabilis* sp. nov. is easily distinguishable from *E. nodifer* by 1) the short and different shape of sensilli (sensilli of *E. nodifer* long and lanceolate in shape); 2) the far shorter interlamellar setae; 3) the rounded dorsosejugal suture (dorsosejugal suture of the Spanish species almost straight); 4) the rounded oval shape of areae porosae as opposed to elongate areae porosae in the compared species, 5) the short median and posterior notogastral setae, and 6)

far smaller body size. The original description and figure by Mihelčič (1956) are insufficient and the generic placement of this species is doubtful, since the Spanish species shows only nine pairs of notogastral setae, and moreover the character of humeral setae is uncertain. However, it should have at least ten pairs of notogastral setae as usual as other members of Oribatulidae, and probably, humeral setae are small, and Mihelčič could not observe them. If so, this species should be removed from the genus *Eporibatula* (see discussion). The South American species, *E. gracilis* can easily be distinguished from the new species by 1) the very narrow lamellae; 2) the smooth and thin rostral, lamellar and interlamellar setae; 3) the long median and posterior notogastral setae; 4) the strongly arched dorsosejugal suture, and 5) the poorly developed and smooth humeral projections. The Chilean species, *E. australis*, is well distinguishable from the new species by 1) the very thin and short lamellae; 2) the presence of distinct striations



**Figs. 11–12.** *Eporibatula tuberosa* Fujikawa, 1972  
11. Dorsal aspect (holotype); 12. Ventral aspect (holotype);

on the prodorsum; 3) the more strongly arched dorsosejugal suture; 4) the long median and posterior notogastral setae, and 5) far larger body size.

**Etymology:** The specific epithet, "variabilis" refers to the variable shape of notogaster and some other variable characters, such as shape of sensilli, size of interlamellar setae and the arrangement of notogastral setae.

***Eporibatula tuberosa* Fujikawa**  
(Figs. 11–23)

*Eporibatula tuberosa* Fujikawa, 1972, p. 173, fig. 75.

*Eporibatula tuberosa*: Fujikawa, 1992, p. 12, fig. 5.

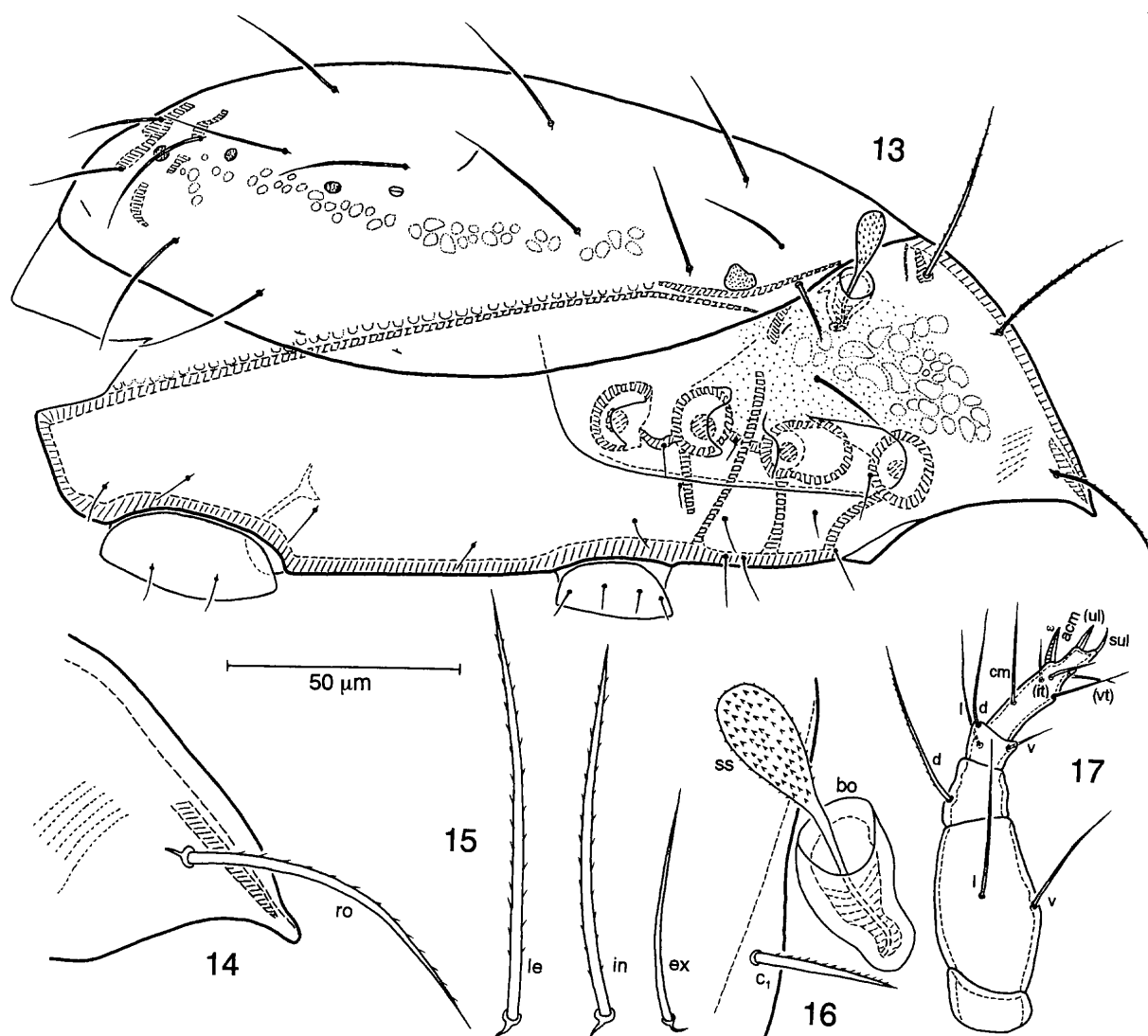
**Diagnosis:** Medium in size, hysterosoma relatively robust in lateral view; rostrum rounded in usual dorsal view, but conspicuously protruding in lateral aspect; lamellae and sublamellae absent; interlamellar setae rather thick and long; sensilli with clavate head with small barbs; fourteen pairs of notogastral setae, humeral setae *c*<sub>1</sub> thicker and shorter than

others, unilaterally barbed; humeral projection inconspicuous; posterior part of notogaster with four tubercles on each side; tibiae I and IV with extremely long solenidia  $\phi$ .

**Measurements:** Body length 457–493 (470.7)  $\mu\text{m}$ ; length of proterosoma 111–172 (142.2)  $\mu\text{m}$ ; width of proterosoma 162–172 (167.6)  $\mu\text{m}$ ; length of hysterosoma 340–435 (342.9)  $\mu\text{m}$ ; width of hysterosoma 264–269 (266.7)  $\mu\text{m}$ .

**Integument:** Yellowish-brown to reddish brown. Cerotegument rather thick, exobothridial region and lateral part of podosoma with fine punctures. Integument smooth.

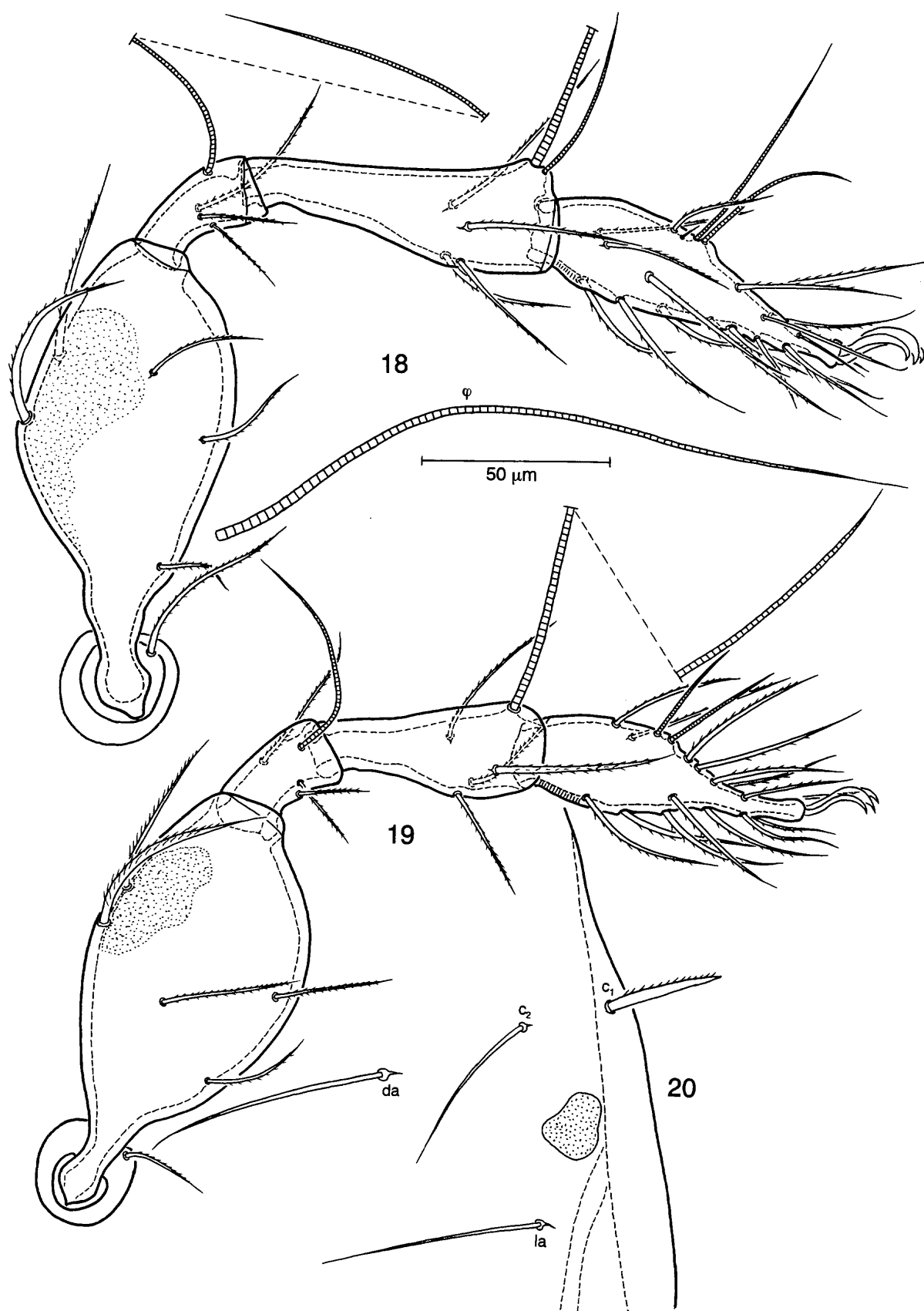
**Prodorsum:** Nearly triangular in shape, its dorsal surface smooth. Rostrum broadly rounded anteriorly. Rostral setae (ro) inserted laterally, conspicuously barbed unilaterally, extending well beyond the tip of rostrum. Lamellae and sublamellae absent. A pair of poorly developed, short ridges obliquely situated anteromediad of each bothridium. Lamellar setae (le) almost as long as rostral ones or scarcely longer,



**Figs. 13–17.** *Eporibatula tuberosa* Fujikawa, 1972

13. Lateral aspect (paratype); 14. Rostrum in lateral view; 15. Interlamellar, lamellar and exobothridial setae; 16. Bothridial region in lateral view; 17. Palp (right, antiaxial aspect).





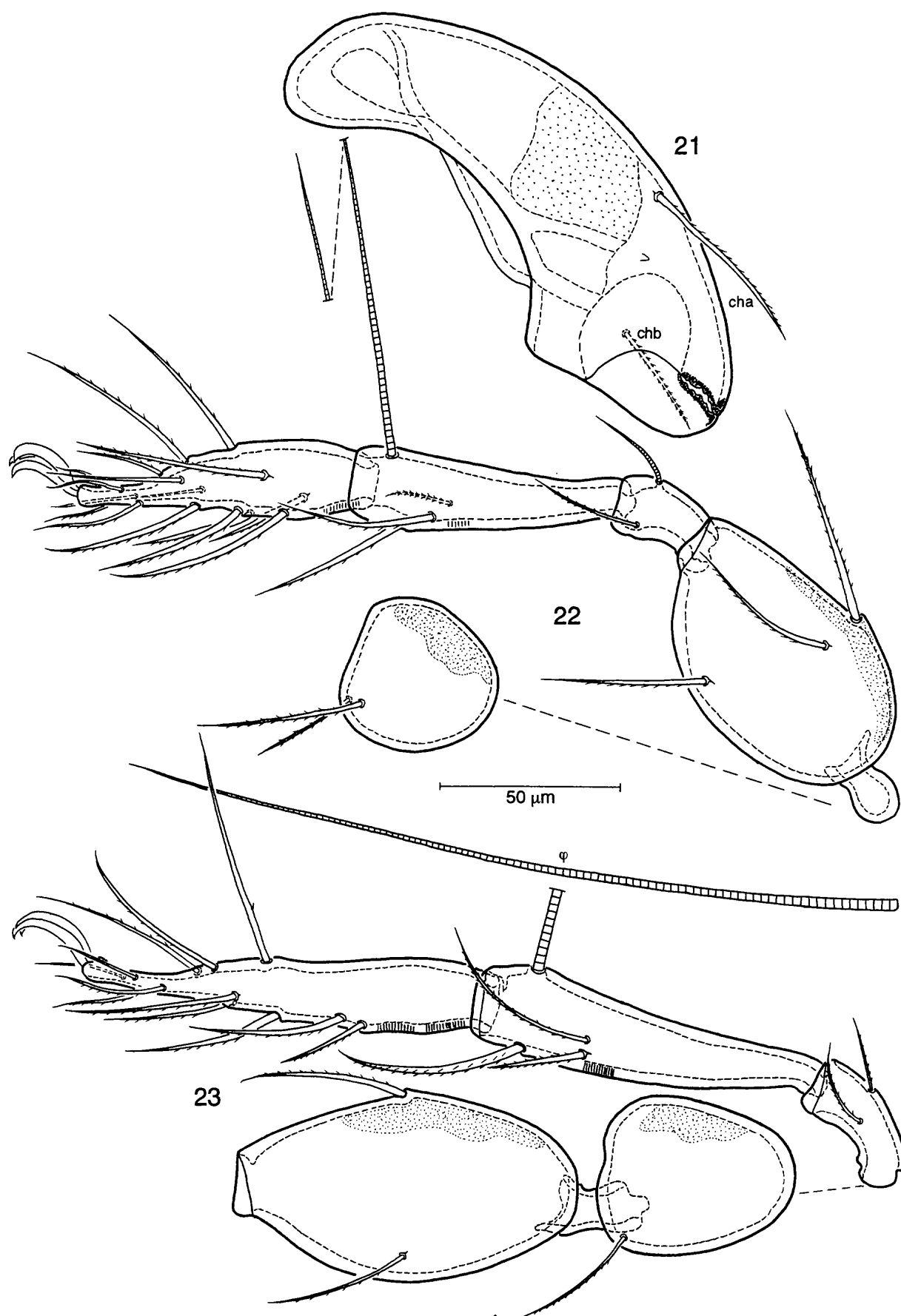
**Figs. 18–20.** *Eporibatula tuberosa* Fujikawa, 1972

18. Leg I (right, antiaxial aspect; solenidion  $\phi$  is drawn separately); 19. Leg II (right, antiaxial aspect); 20. Humeral region in lateral view.

conspicuously barbed bilaterally, and extending well beyond the tip of rostrum. Interlamellar setae (in) longer than lamellar setae, conspicuously barbed bilaterally (Figs. 11, 14 and 15). Sensilli relatively short, with clavate head. Bothridium (bo)

relatively small, but rather deep (Figs. 11, 13–16).

**Notogaster:** Surface smooth, slightly narrowed anteriorly. Numerous muscle sigillae scattered along its lateral and pos-



**Figs. 21–23.** *Eporibatula tuberosa* Fujikawa, 1972

21. Chelicera (right, antiaxial aspect); 22. Leg III (right, paraxial aspect); 23. Leg IV (right, paraxial aspect; solenidion  $\phi$  is drawn separately).

terolateral margins. Posterior part of notogaster with four tubercles on each side, which are situated along its posterior margin. Dorsosejugal suture complete, strongly arched anteriorly. Humeral projection inconspicuous. Fourteen pairs of notogastral setae; humeral setae  $c_1$  unilaterally barbed, distinctly thicker, but shorter than the others, remaining notogastral setae long, almost twice as long as the former one, but smooth and thin. Four pairs of small areae porosae rounded oval;  $Aa$  distinctly larger than others, situated rather marginally (Figs. 11, 13 and 20). Lyrifissures  $ia$ ,  $im$ ,  $ip$ ,  $ih$  and  $ips$  well developed;  $im$  situated anterior of setae  $ip$ , other lyrifissures visible only in lateral view. Latero-opisthosomal gland opening  $gla$  situated posterolateral to  $im$  (Figs. 11 and 13).

**Lateral aspect:** Dorso-ventral thickness of hysterosoma in postgenital transect 192–233 (212.5)  $\mu\text{m}$ . Rostrum distinctly projected anteroventrad. Exobothridial region and lateral part of podosoma with numerous punctures. A number of muscle sigillae visible anterior of bothridium. Sensillus (ss) clavate, bothridium rather deep or long in lateral view (Figs. 13, 14 and 16). Exobothridial setae (ex) long, thick, but smooth. Lyrifissure  $ia$  situated posterior to bothridium;  $ih$  and  $ips$  anterolaterad of  $h_3$ ;  $ip$  posterolaterad of  $p_1$ . Carina circum-pedalis long, reaching to the lateral margin of ventral plate (Fig. 13).

**Gnathosoma:** Hypostomal surface smooth; setae  $a$ ,  $h$  and  $m$  short and thin. Anteromedian margin of rutellum strongly sclerotized, with a few blunt teeth. Labium rather large. Palpal setation: 0-2-1-3-10 including both ventral setae and solenidion  $\omega$  of tarsus. Tarsal solenidion  $\omega$  and anteroculminal eupathidium  $acm$  fused together, and two other eupathidia (ul) also coupled and fused together (Fig. 17). Chelicerae with sclerotized teeth; area porosa  $cap$  situated dorsolaterally; setae  $cha$  and  $chb$  conspicuously barbed, the former is far longer than the latter (Fig. 21).

**Epimeral region:** Smooth, a few muscle sigillae situated around seta  $4b$ . Apodema  $apo.sj$  long, while  $apo.1$ ,  $apo.2$  and  $apo.3$  slightly shorter, but wider than the former one. Epimeral setae thin, smooth; setal formula of epimerata: 3-1-3-3. Seta  $3c$  situated on the distinctly projected apophysis. Discidium short and narrow, epimeral seta  $4c$  inserted on it. Pedotectum I large, its surface smooth; pedotectum II scale-like, relatively small (Fig. 12).

**Ano-genital region:** Surface of ventral plate, and both anal and genital plates smooth. Anal and genital apertures situated far from each other, the former being a little longer and wider than the latter. Four pairs of genital, one pair of aggenital, two pairs of anal and three pairs of slender adanal setae approximately same in length. Seta  $ad_3$  situated in preanal position. Paired adanal lyrifissure  $iad$  very small, situated adjacent and parallel to the anterolateral margin of anal aperture (Fig. 12).

**Legs:** All tarsi heterotridactylous, with lateral claws thinner than empodial claw; dorsal surface of claws smooth. Femora I-IV and trochantera III and IV with large areae porosae. Tibia I with a poorly developed apophysis for solenidia;  $\phi_1$  extremely long, nearly as long as total length of genu, tibia and tarsus I. Solenidion  $\phi$  of tibia IV also very long, almost equal with total length of tibia and tarsus IV. The formula of leg setation (including famulus): I (1-5-3-4-19); II (1-5-3-4-15); III (2-3-1-3-16); IV (1-2-2-3-12); the formula of solenidia: I (1-2-2); II (1-1-2); III (1-1-0); IV (0-1-0). Structure and setation of legs I-IV as shown in Figs. 18, 19, 22 and 23.

**Variations:** No noticeable variation in certain character states was observed. Most important features of examined three specimens were more constant. Only the arrangement of some epimeral and genital setae was slightly variable, i.e. in one specimen some setae were situated asymmetrically.

**Material examined:** We examined the holotype and two paratype specimens, which were mounted in one slide, labeled as: Sapporo, Nopporo, Todomatsu rin, 1967-III-7 (abies forest-*Abies sachaliensis*, bark of the trees).

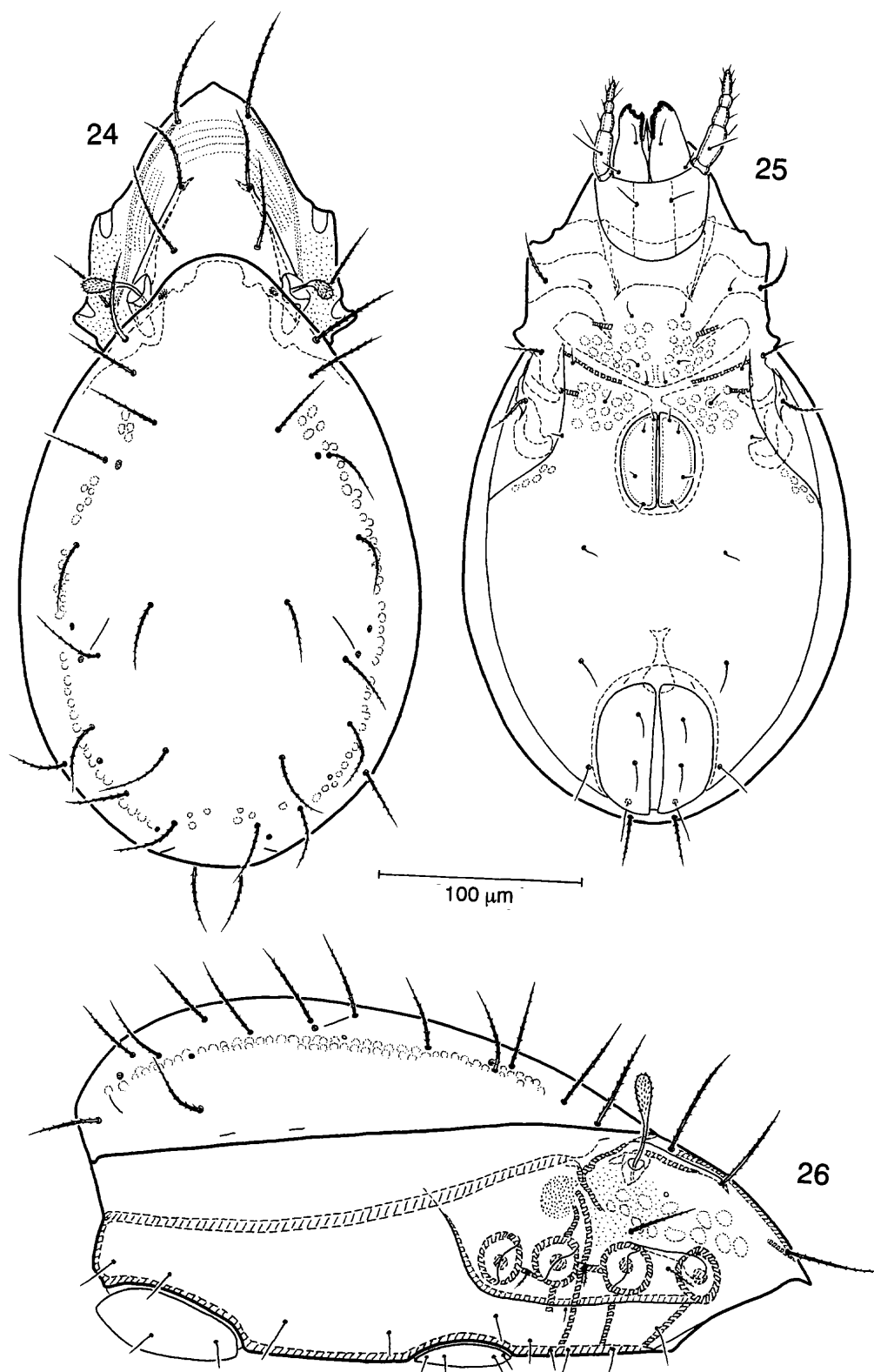
**Known distribution:** Japan: Hokkaido, Yamanashi and Nagano Prefectures (Fujikawa *et al.*, 1993).

**Remarks:** The following characters are not well corresponding to the original description. In the original description the author (Fujikawa, 1972) mentioned that sensillus bears a fusiform head, but the holotype and two paratypes show only a clavate shaped head in lateral aspect. In the figure of dorsal aspect the author showed almost straight dorsosejugal suture, but it is strongly arched in the specimens examined here. Adanal setae  $ad_3$  are in paranal position in the original figure, but they are in fact preanal position in the examined specimens. In the original description, the author mentioned that this species has 13 pairs of notogastral setae, but in the figure 75 she illustrated 14 pairs of setae on both the right and the left sides as we observed here (Figs. 11 and 13). Excepting for these points, the features of the examined specimens accord well with the original description and figures. Some supplementary characters are given in the present redescription.

***Eporibatula prominens* Bayartogtokh et Aoki**  
(Figs. 24–34)

*Eporibatula prominens* Bayartogtokh et Aoki, 1998, p. 121, figs. 1–4.

**Diagnosis:** Relatively small in size, hysterosoma relatively robust in lateral view; rostrum projected, anterior margin narrowly rounded; lamellae and sublamellae narrow, narrowed toward anterior direction, the former having a short extension anterior to the insertion of the lamellar setae; prodorsal setae conspicuously barbed bilaterally; sensilli with club-shaped head with small barbs; thirteen pairs of notogastral setae, humeral setae  $c_1$  thicker and slightly longer than others, with



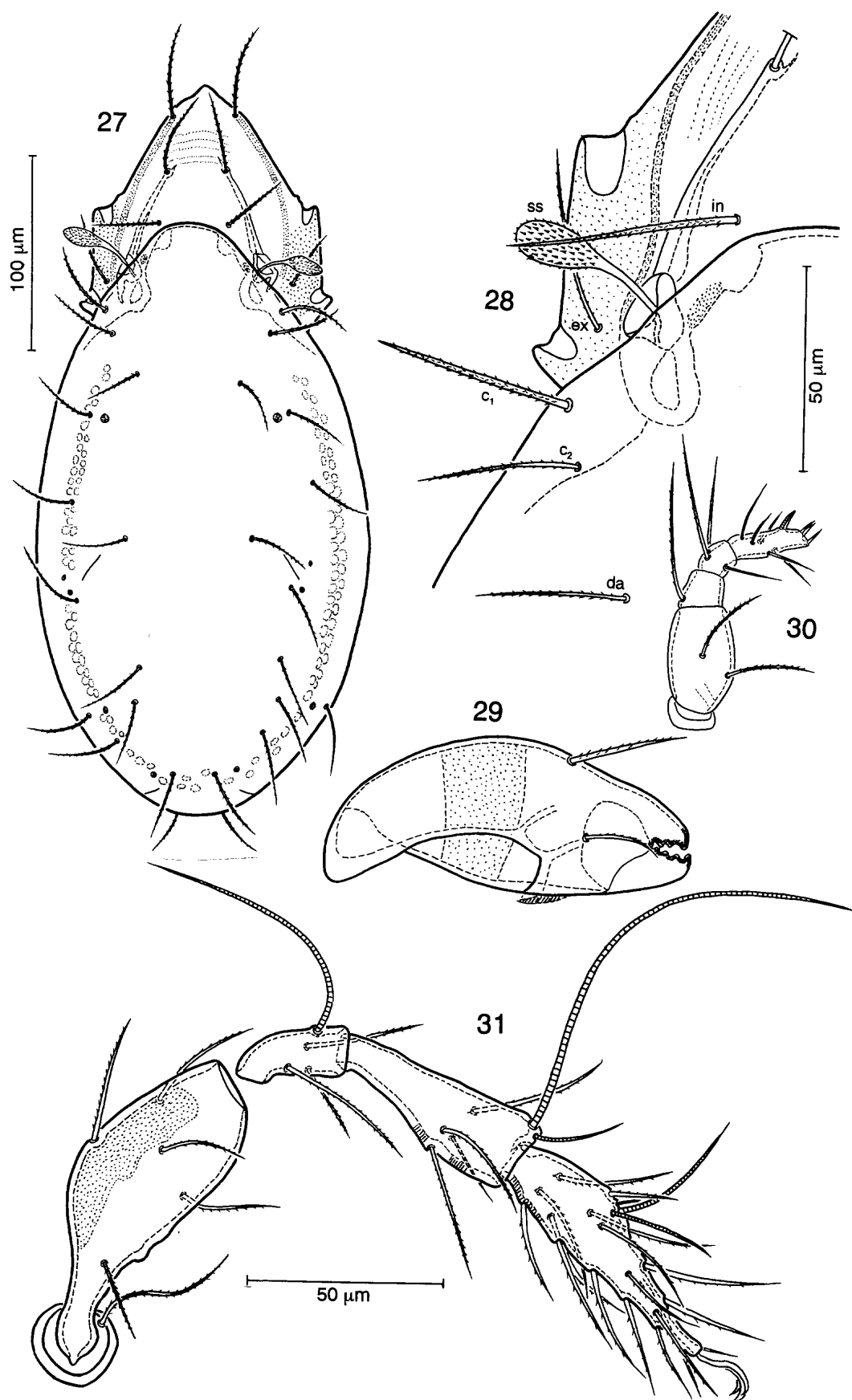
**Figs. 24–26.** *Eporibatula prominens* Bayartogtokh et Aoki, 1998  
 24. Dorsal aspect; 25. Ventral aspect; 26. Lateral aspect.

more rough barbation; seta  $h_2$  absent; humeral projection inconspicuous; posterior part of notogaster without tubercles.

**Measurements:** Body length 350–386 (369.8)  $\mu\text{m}$ ; length of proterosoma 71–96 (80.3)  $\mu\text{m}$ ; width of proterosoma 117–132 (125.7)  $\mu\text{m}$ ; length of hysterosoma 264–309 (291.6)  $\mu\text{m}$ ; width of hysterosoma 173–210 (192.8)  $\mu\text{m}$ .

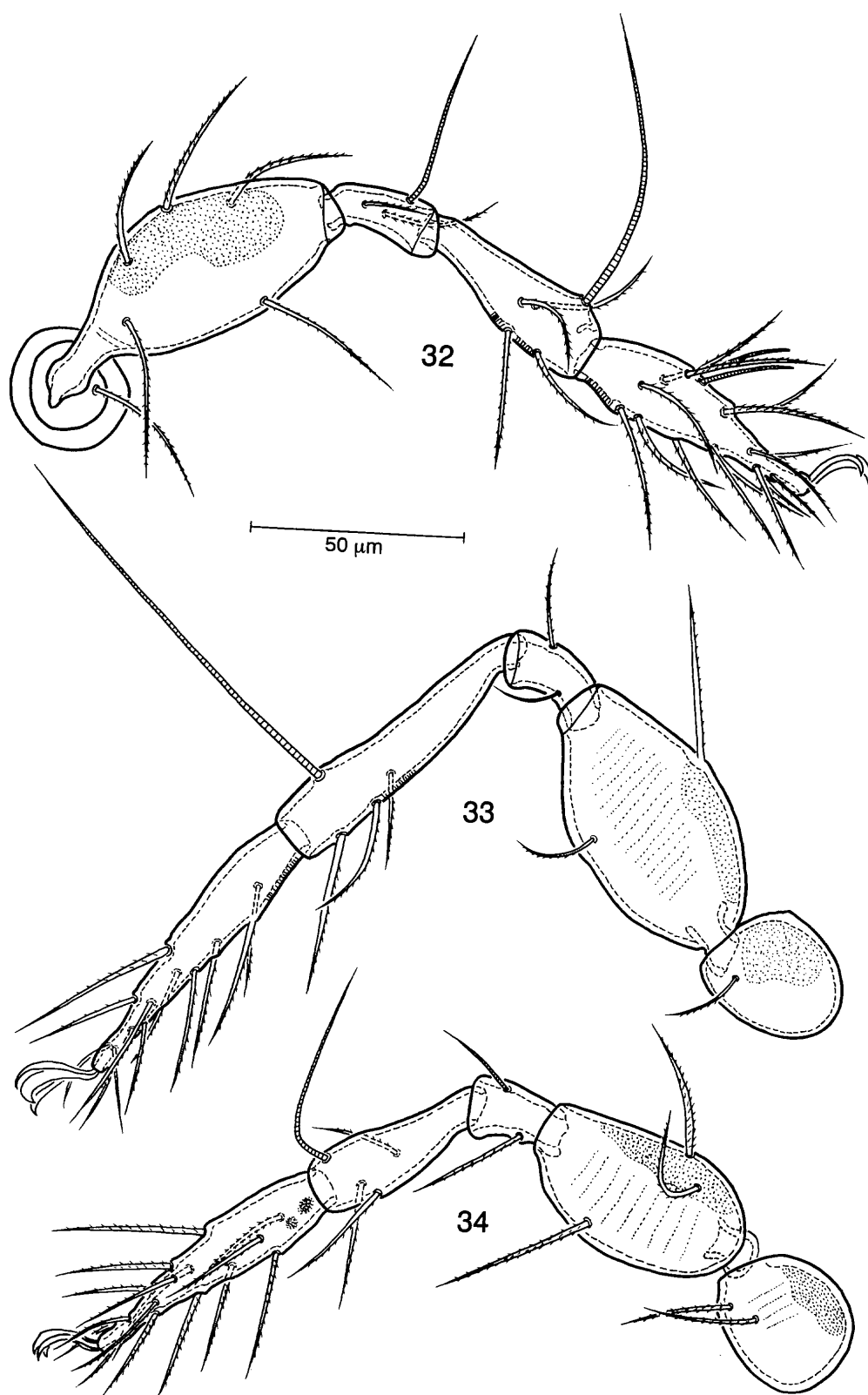
**Integument:** Light yellowish to yellowish-brown. Cero-tegument thin, exobothridial region and lateral part of podosoma with fine punctures. Dorsal part of prodorsum with rugose structure.

**Prodorsum:** Dorsal surface with rugose structure. Rostrum distinctly projected, anterior margin narrowly rounded.



**Figs. 27–31.** *Eporibatula prominens* Bayartogtokh et Aoki, 1998

27. Dorsal aspect (showing the variation of notogaster and arrangement of notogastral setae); 28. Lateral part of prodorsum and notogaster; 29. Chelicera (left, paraxial aspect); 30. Palp (left, antiaxial aspect); 31. Leg I (left, paraxial aspect).



**Figs. 32–34.** *Eporibatula prominens* Bayartogtokh et Aoki, 1998  
 32. Leg II (right, antiaxial aspect); 33. Leg IV (right, paraxial aspect); 34. Leg III (right, paraxial aspect).

Prodorsal setae bilaterally barbed, approximately same length, but interlamellar setae scarcely shorter than the others. Lamellae and sublamellae narrow, distinctly narrowed anteriorly. A pair of poorly developed, but long ridges situated outside of each lamella and reaching to the insertions of rostral setae. Sensilli relatively long, with club-shaped head and rather long, but thin stalk. Bothridium (bo) relatively small, posterior scale

well developed (Figs. 24, 26–28).

**Notogaster:** Surface smooth, slightly narrowed anteriorly. A number of muscle sigillae scattered along its lateral and posterior margins. Shape of notogaster slightly variable. Mostly oval in shape (Fig. 24), but in some specimens it was more narrowed (Figs. 27). Posterior part of notogaster smoothly

rounded. Dorsosejugal suture strongly arched. Humeral projection inconspicuous. Thirteen pairs of notogastral setae bilaterally barbed; humeral setae  $c_1$  more roughly barbed, distinctly thicker and slightly longer than the others (Fig. 28). Four pairs of very small round areae porosae;  $Aa$  slightly larger than others, situated rather medially (Figs. 24, 26 and 27). Lyrifissures  $ia$ ,  $im$ ,  $ip$ ,  $ih$  and  $ips$  well developed;  $ia$  situated anteromedial of setae  $c_1$ ,  $im$  anterior of  $ip$ ;  $ip$  posterolateral of  $h_1$ ;  $ih$  and  $ips$  visible only in lateral view. Latero-opisthosomal gland opening  $gla$  situated lateral to  $im$  (Figs. 11 and 13).

**Lateral aspect:** Dorso-ventral thickness of hysterosoma in postgenital transect 152–163 (157.5)  $\mu\text{m}$ . Rostrum distinctly projected anteroventrad. Exobothridial region and lateral part of podosoma with numerous punctures. A number of muscle sigillae visible between bothridium and pedotectum II. Sensillus ( $ss$ ) clavate, its stalk long. Exobothridial setae ( $ex$ ) long, thick, bilaterally barbed. Carina circumpedalis long, reaching to the lateral margin of ventral plate (Fig. 26).

**Gnathosoma:** Hypostomal surface smooth; setae  $a$ ,  $h$  and  $m$  thin, smooth. Anterior and median margin of rutellum strongly sclerotized, with a few blunt teeth. Labium relatively small, sharply pointed. Palpal setation: 0-2-1-3-10 including both ventral setae and solenidion  $\omega$  of tarsus. Tarsal solenidion  $\omega$  and anteroculminar eupathidium  $acm$  fused together, and two other eupathidia ( $ul$ ) also coupled proximally, but separated distally (Fig. 30). Chelicerae with sclerotized teeth, area porosa  $cap$  situated dorsolaterally; setae  $cha$  and  $chb$  weakly barbed, the former one is far longer and thicker than the latter (Fig. 29).

**Epimeral region:** Smooth, a number of muscle sigillae situated its median part. Apodema  $apo.sj$  long, while  $apo.1$ ,  $apo.2$  and  $apo.3$  short. Epimeral setae thin, mostly smooth, only setae  $1c$ ,  $3c$  and  $4c$  finely barbed bilaterally; setal formula of epimerata: 3-1-3-3. Discidium short and narrow, epimeral seta  $4c$  inserted on it. (Fig. 25).

**Ano-genital region:** Surface of ventral plate, and both anal and genital plates smooth. Anal and genital apertures situated far from each other, the former being far larger than the latter. Four pairs of genital, one pair of aggenital, two pairs of anal and three pairs of slender adanal setae. Seta  $ad_3$  situated in preanal position. Paired adanal lyrifissure  $iad$  very small, situated obliquely and close to the anterior margin of anal aperture (Fig. 25).

**Legs:** All tarsi heterotridactylous, with lateral claws thinner than empodial claw; dorsal surface of claws smooth. The formula of leg setation (including famulus): I (1-5-3-4-18); II (1-5-2-4-15); III (2-3-1-3-15); IV (1-2-2-3-12); the formula of solenidia: I (1-2-2); II (1-1-2); III (1-1-0); IV (0-1-0). Structure and setation of legs I-IV as shown in Figs. 31–34.

**Variations:** In the studied specimens the following varia-

tions in morphological characters were noted. The shape of notogaster is slightly variable as shown in Figs. 24 and 27. Most specimens have relatively wide and oval notogaster, but some specimens have more narrow, elongate oval notogaster with slightly narrowed posterior part. The arrangement of notogastral setae was also slightly different in the above two forms.

**Material examined:** Five specimens: District Sumber, Gobisumber province, desert-steppe (*Caragana microphylla*), 26-VII-1992; one specimen: Mt. Zorgol Khaikhan, District Bayan-Unjuul, Central Province, mountain-steppe (*Stipa grandis* + *Cleistogenes soongorica*), 15-IX-1991; one specimen: District Bayan, Central Province, dry-steppe (*Cleistogenes squarosa* + *Agropyron cristatum*), 28-VII-1990, Leg. B. Bayartogtokh.

**Known distribution:** Mongolia: District Sumber, Gobisumber province (Bayartogtokh and Aoki, 1998), and from localities given in the "Material examined" section.

**Remarks:** Apodema  $apo.2$  in the specimens studied here was much shorter than that of the type specimens. Adanal lyrifissures  $iad$  of the present specimens are obliquely situated, while they were almost transversely situated in the type specimens. Excepting for these points, the features of the examined specimens accord well with those of the type specimens. Some supplementary characters are given in the present redescription.

***Eporibatula sakamorii* (Aoki), comb. nov.**

(Figs. 35–42)

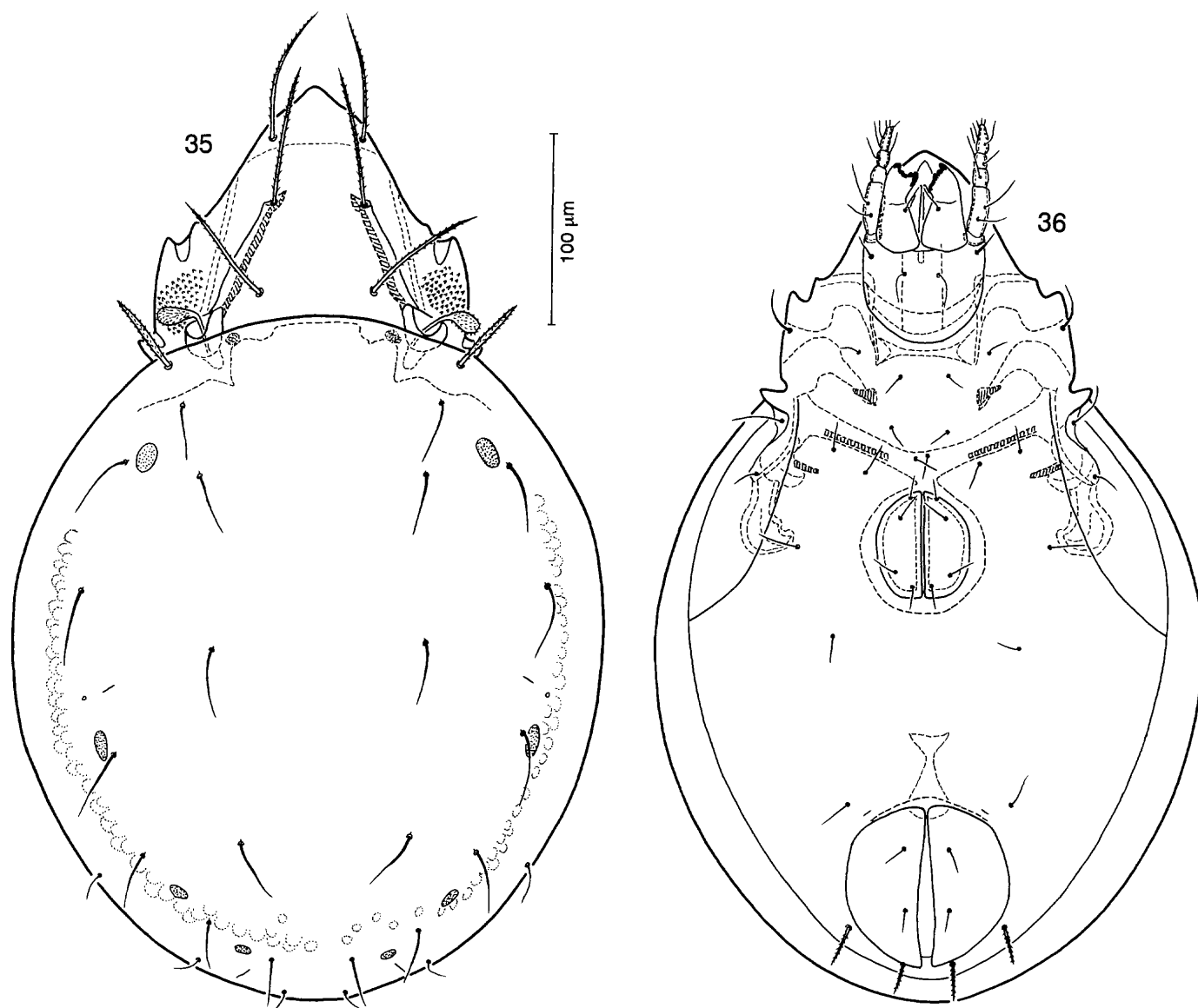
*Oribatula sakamorii* Aoki, 1970, p. 581, figs. 1–10.

*Oribatula sakamorii*: Fujikawa, 1983, p. 1, fig. 3; Wen and Zhang, 1988, p. 121, figs. 1 & 2; Aoki, 2000, p. 52, fig. 3 (19).

**Diagnosis:** Medium in size, hysterosoma very robust in lateral view; rostrum projected, anterior margin rounded in dorsal view; lamellae narrow, almost same width throughout its length or slightly narrowed toward anterior direction, with a short extension anterior to the insertion of the lamellar setae; sublamellae absent; prodorsal setae bilaterally barbed; sensilli with club-shaped head with small barbs; fourteen pairs of notogastral setae, humeral setae  $c_1$  much thicker than the others, with more rough barbatation; humeral projection poorly developed; adanal setae  $ad_1$  and  $ad_2$  bilaterally barbed, distinctly thicker than the other ano-genital setae.

**Measurements:** Body length 447–488 (457.9)  $\mu\text{m}$ ; length of proterosoma 96–127 (113.9)  $\mu\text{m}$ ; width of proterosoma 157–183 (166.5)  $\mu\text{m}$ ; length of hysterosoma 325–366 (343.9)  $\mu\text{m}$ ; width of hysterosoma 289–320 (304.1)  $\mu\text{m}$ .

**Integument:** Light yellowish-brown to deep reddish brown. Cerotegument rather thick, exobothridial region granulated, and lateral part of podosoma with fine punctures.



**Figs. 35–36.** *Eporibatula sakamorii* (Aoki, 1970)  
35. Dorsal aspect; 36. Ventral aspect.

**Prodorsum:** Rostrum slightly projected in dorsal view, but anterior margin rounded. Prodorsal setae bilaterally barbed, approximately same length, but rostral setae scarcely shorter than the others. Lamellae narrow, slightly narrowed anteriorly or same width throughout its length. A pair of very poorly developed ridges situated outside of each lamella. Sensilli with club-shaped head and thin stalk, however, shape of sensillar head slightly variably. Bothridium (bo) rather large, posterior scale well developed (Figs. 35 and 37).

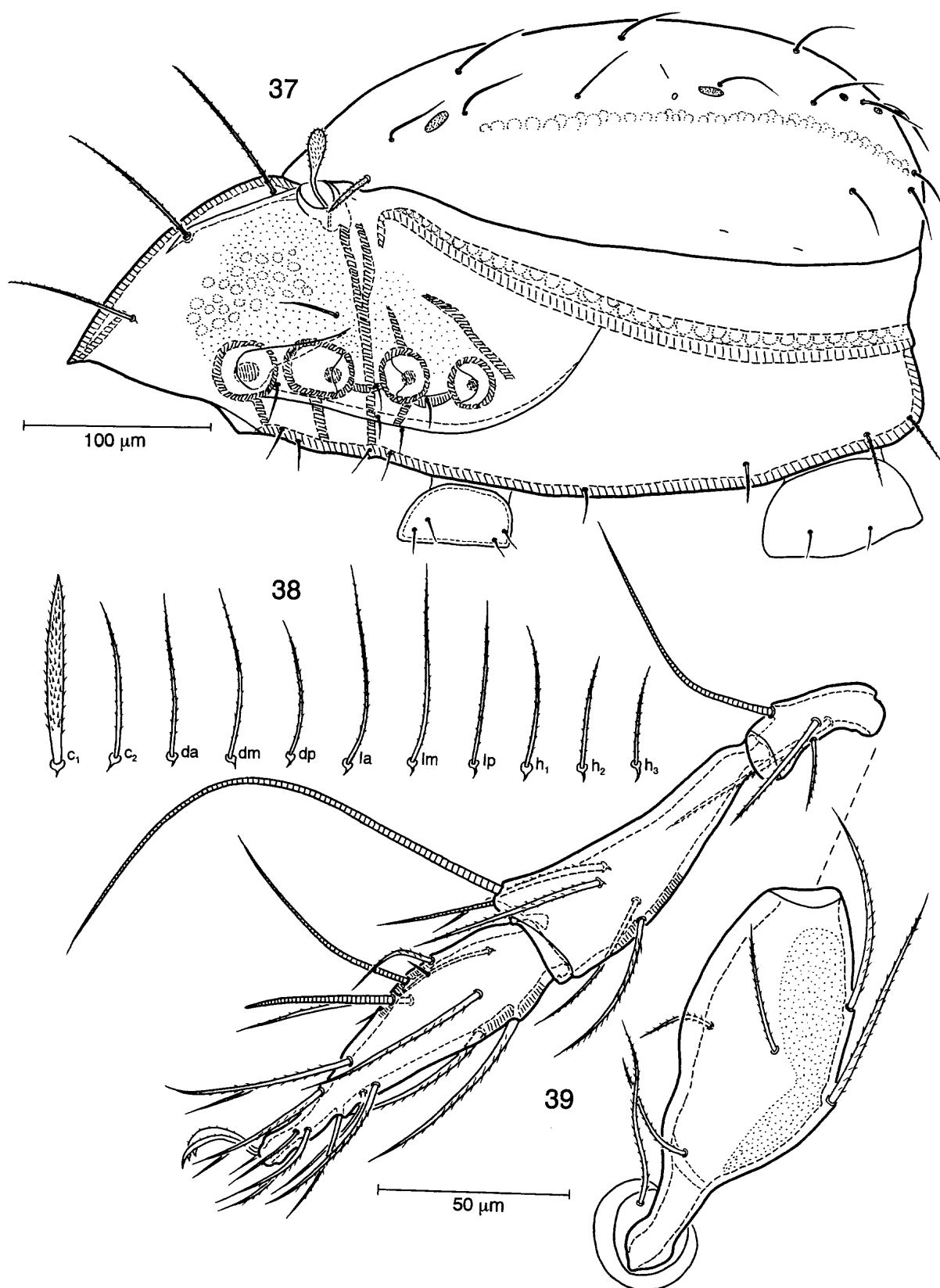
**Notogaster:** Rounded oval, surface smooth. Shape of notogaster slightly variable as stated in the original description. A number of muscle sigillae scattered along its lateral and posterior margins. Dorsosejugal suture widely rounded. Humeral projection poorly developed, hardly projected beyond the outline of notogaster. Fourteen pairs of notogastral setae; humeral setae *c*<sub>1</sub> more roughly barbed and much thicker than the others; remaining notogastral setae weakly barbed bilaterally (Fig. 38). Four pairs of large, oval areae porosae; *Aa*

and *A*<sub>1</sub> conspicuously larger than others, situated close to setae *la* and *lp*, respectively (Figs. 35 and 37). Lyrifissures *ia*, *im*, *ip*, *ih* and *ips* well developed; *ia* situated underneath humeral region, *im* anterior of setae *lp*; *ip* posterolaterad of *h*<sub>1</sub>; *ih* and *ips* visible only in lateral view. Latero-opisthosomal gland opening *gla* situated posterolateral to *im* (Figs. 35 and 37).

**Lateral aspect:** Dorso-ventral thickness of hysterosoma in postgenital transect 223–249 (238.7) µm. Rostrum distinctly projected anteroventrad. Lateral part of podosoma with fine punctures. A number of muscle sigillae visible between lamella and pedotectia I and II. Sensillus (ss) club-shaped, its stalk thin. Exobothridial setae (ex) long, thick, but smooth. Carina circumpedalis long, reaching to the lateral margin of ventral plate (Fig. 37).

**Gnathosoma:** Hypostomal surface smooth; setae *a*, *h* and *m* thin, smooth. Anterior and median margin of rutellum strongly sclerotized, with a few blunt teeth. Labium relatively





**Figs. 37–39.** *Eporibatula sakamorii* (Aoki, 1970)

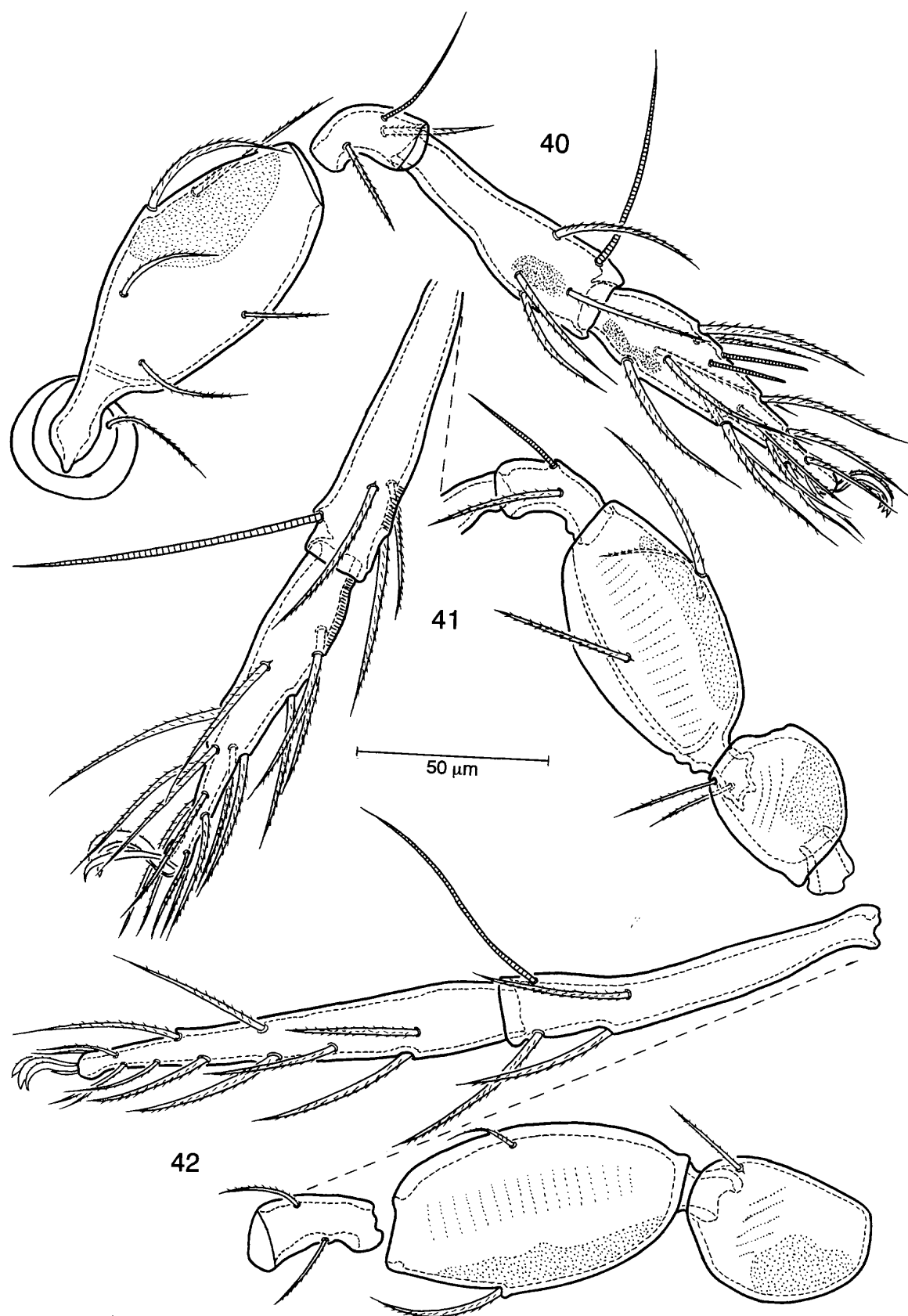
37. Lateral aspect; 38. Notogastral setae, excluding setae *p* series; 39. Leg I (left, antiaxial aspect).

small (Fig. 36). Chelicerae and palps normal for the genus. Palpal setation: 0-2-1-3-10 including both ventral setae and solenidion  $\omega$  of tarsus.

**Epimeral region:** Smooth, without reticulation or granules.

Apodema *apo.sj* long, while *apo.1*, *apo.2* and *apo.3* short. Epimeral setae thin, smooth, setae *1c* and *3c* slightly longer than the others; setal formula of epimerata: 3-1-3-3 (Fig. 36).

**Ano-genital region:** Surface of ventral plate, and both anal



**Figs. 40–42.** *Eporibatula sakamorii* (Aoki, 1970)

40. Leg II (left, paraxial aspect); 41. Leg III (right, paraxial aspect); 42. Leg IV (right, paraxial aspect).

and genital plates smooth. Anal and genital apertures situated far from each other, the former being far larger than the latter. Four pairs of genital, one pair of aggenital, two pairs of anal and three pairs of adanal setae. Adanal setae  $ad_1$  and

$ad_2$  bilaterally barbed, distinctly thicker than the other adanal setae. Seta  $ad_3$  situated in preanal position. Adanal lyrifissures  $iad$  very small, situated close and parallel to the anterolateral margin of anal aperture (Fig. 36).

**Legs:** All tarsi heterotridactylous, with lateral claws thinner than empodial claw; dorsal surface of claws with a slight serration. The formula of leg setation (including famulus): I (1-5-3-4-18); II (1-5-2-4-15); III (2-3-1-3-15); IV (1-2-2-3-12); the formula of solenidia: I (1-2-2); II (1-1-2); III (1-1-0); IV (0-1-0). Structure and setation of legs I-IV as shown in Figs. 39–42.

**Variations:** In the studied specimens the following variations in morphological characters were noted. The shape of notogaster was slightly variable. Most specimens have relatively wide and rounded oval notogaster, but some specimens have more narrow, elongate oval notogaster with slightly narrowed posterior part. The shape of sensillus was also slightly variable. Most specimens has typically club-shaped sensilli, but some specimens bearing more narrow and elongated head of sensilli.

**Specimens used for redescription:** 68 specimens: Campus of Tottori University, Koyama-cjo, Tottori City, 10-XI-1999, Leg. N. Tsurusaki and J. Aoki.

**Known distribution:** Japan (Fujikawa *et al.*, 1993), China (Wen and Zhang, 1988; Aoki *et al.*, 1997) and Korea (Choi, 1997).

**Remarks:** Apodemata *apo.2* and *apo.sj* in the specimens studied here was distinctly shorter and slender, respectively than those of the type specimens. Except for these points, the features of the examined specimens accord well with those of the type specimens. Some supplementary characters are given

in the present redescription. On the basis of the presence of very thick humeral setae  $c_1$  we included this species in the revised genus *Eporibatula* (see discussion).

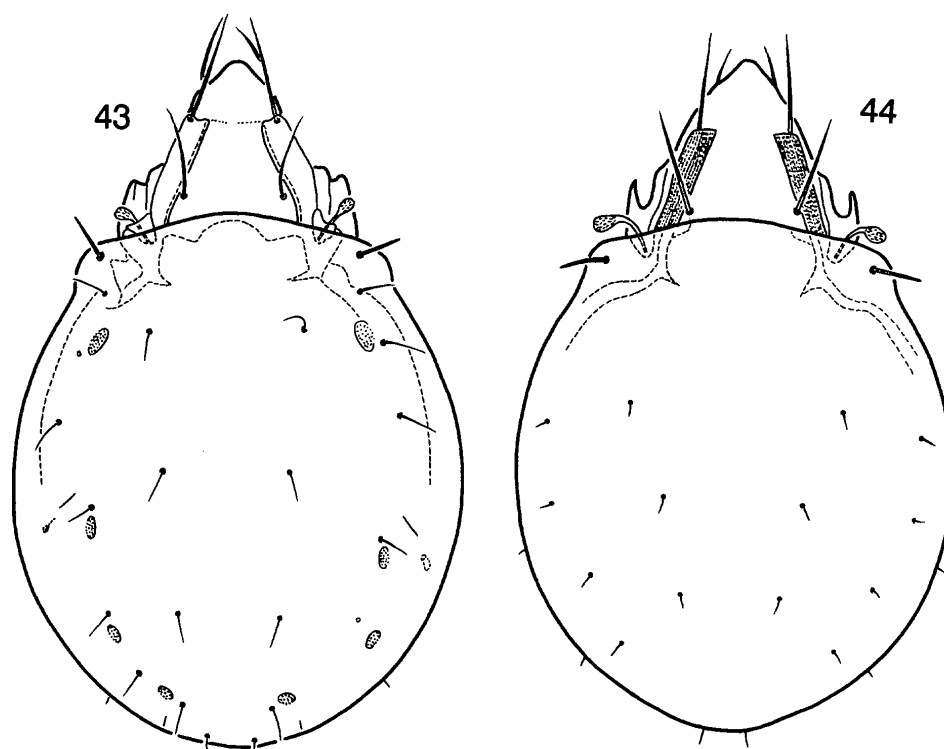
***Eporibatula venusta* (Berlese), *comb. nov.***

(Figs. 43 and 44)

*Oribatula venusta* Berlese, 1908, p. 8.

*Oribatula venusta*: Berlese, 1910, p. 229, fig. 70; Thor, 1931, p. 23, fig. 72; Lombardini, 1936, p. 46; Mahunka, 1994, p. 37, fig. 12.

The species is monotypical and has been described by Berlese (1908) from Norway. However, the original description is inadequate, and Berlese briefly formulated only the body size (600  $\mu\text{m}$  in length, 400  $\mu\text{m}$  in width), shape of notogaster (rounded) and sensillus (clavate), without any figure. Subsequently, Berlese (1910) illustrated dorsal view of his species, but did not supplemented any more description. Recently, Mahunka (1994) partially redescribed this species and drawn only dorsal aspect, examining single type specimen. The latter author formulated that "small pteromorpha present, seta  $c_2$  straight, spiniform, arising on it" (actually this seta is not  $c_2$ , but it should be  $c_1$ ; see Figs. 43 and 44). According to the figures given by Berlese (1910) and Mahunka (1994) it is obvious that seta  $c_1$  on the humeral region is conspicuously thicker and longer than the other notogastral setae (Figs. 43 and 44). In the diagnostic key to the known species of *Eporibatula*, we included this species in the group, which bears 13 pairs of notogastral setae (see discussion). However, in his redescription, Berlese (1910) showed only 11 setae on both the right and left sides of notogaster, but it is obvious that he overlooked some setae. In his recent redescription,



**Figs. 43–44.** *Eporibatula venusta* (Berlese, 1908)

43. Dorsal aspect (redrawn after Mahunka, 1994); 44. Dorsal aspect (redrawn after Berlese, 1910).

Mahunka (1994) illustrated 13 setae on the left and 12 on the right side of notogaster. It is obviously seems to be that left seta *la* and right setae *h*<sub>2</sub> and *ps*<sub>2</sub> of the type specimen were broken, and Mahunka could not observe the insertion pore of right seta *ps*<sub>2</sub> (he showed insertion of right *la* and left *h*<sub>2</sub>). Moreover, the figure of this species, given by Thor (1931) clearly shows the presence of 13 pairs of setae on both the right and left sides of notogaster.

Unfortunately we had no opportunity to examine the type specimen, but the above descriptions and figures shows that this species being with typical character of *Eporibatula* (see discussion).

## DISCUSSION

The generic placement of the new species, *E. variabilis* sp. nov. can be questioned, considering the past and the present classifications of Oribatulidae. Balogh and Balogh (1992) considered that species of *Eporibatula* have 11–14 pairs of notogastral setae. When first trying to determine the generic placement of this species, we were drawn immediately to comparisons with *Subphauloppia*, based on similarities of adult characters (following the generic classification by Balogh and Balogh, 1992). The presence of ten pairs of notogastral setae, four pairs of genital setae, and the complete dorsosejugal suture all contribute to this appearance. Despite these similarities, an important character, which define *Eporibatula*, is not found in *Subphauloppia* species. This character is the strongly developed humeral setae, which are thicker than the other notogastral setae. Several other genera, such as *Oribatula*, *Phauloppia*, *Subphauloppia* and *Gerloubia* are also closely related with *Eporibatula* in some respects, such as the number of notogastral and genital setae, the presence of complete dorsosejugal suture, the absence of translamella, the presence of aggenital setae etc. However, the former genera do not show the same character of humeral setae as in *Eporibatula*. Thus, we consider that the presence of thick humeral setae is the most important character of the genus *Eporibatula*, and therefore, included our new species in this genus.

Additional species of the other related genera mentioned above, which bear thick humeral setae will likely belong to *Eporibatula* as defined here. As far as we know, only two species, which were originally assigned in *Oribatula*, bear thick humeral setae. They are *Oribatula venusta* Berlese, 1908 and *Oribatula sakamorii* Aoki, 1970. The original description of the first species by Berlese (1908) was inadequate, but according to the redescrptions by Berlese (1910) and Mahunka (1994) this species clearly bears the typical character of *Eporibatula* (presence of one pair of thick humeral setae *c*<sub>1</sub>, which are conspicuously thicker than the other notogastral setae).

The original description and redescription of *Oribatula sakamorii* by Aoki (1970) and Fujikawa (1983) are showed that the species has also typical character of *Eporibatula* (a pair of very thick humeral setae *c*<sub>1</sub>, which are barbed and much

different from the remaining notogastral setae). Thus, both the species are found to have typical characters of *Eporibatula*, and therefore, we encompassed them in this genus.

The lamellae of the former species are wide and slightly broadened anteriorly (Figs. 43 and 44). Concerning this character the placement of this species in the genus *Eporibatula* might be questioned, but we consider that the shape of lamellae is of less diagnostic value, and it is much variable within several closely related oribatulid genera. Balogh and Balogh (1992) defined that the genus *Eporibatula* has linear lamellae or is lacking in them, while the genus *Oribatula* has anteriorly broadened lamellae. However, many species of *Oribatula* have anteriorly narrowed or linear lamellae as in *Eporibatula* (e.g. *O. pallida* Ewing, *O. pisacensis* Hammer, *O. pannonica* Willmann, *O. florens* Berlese, *O. elegantissima* Balogh et Mahunka, *O. runcinata* Lee, *O. lineata* Bayartogtokh et Aoki etc). Moreover, the "old" members of *Eporibatula* show not only linear, but also different type of lamellae, i.e. some species bear rather wide lamellae, but some of them with incompletely developed lamellae or even without them. Therefore, the shape of lamellae cannot be used as a generic character for some adjacent oribatulid genera, and it should not contradict to include the species with broad lamellae in the genus *Eporibatula*.

We have checked the known species of above mentioned oribatulid genera, which are closely related with *Eporibatula*. Only two species of *Phauloppia*, *P. vallei* and *P. longiporosa* described by Bernini (1973) and Mahunka (1982), respectively, seems to have slightly different (shorter and thicker than others?) humeral setae *c*<sub>1</sub>. However, without examining the type specimens it is difficult to determine whether these are properly members of *Eporibatula* or not. Concerning the latter species, Mahunka (1997) considered recently that *Phauloppia longiporosa* is a junior homonym and synonym of *P. longiporosa* Kulijew, 1968 and *P. conformis* (Berlese, 1895), respectively, but the last mentioned species is also considered as a junior synonym of *P. lucorum* (C. L. Koch, 1841) (see Marshall *et al.*, 1987, p. 253 and 257). The definitive classification requires the study of the type material.

As we mention above (in introduction), not only the shape of lamellae, but also the number of notogastral setae is of less diagnostic value for the genus *Eporibatula*, and the species which were originally included in this genus show different number of notogastral setae. Three of them has 14 pairs of notogastral setae (*E. rauschenensis* (Sellnick, 1908), *E. tuberosa* Fujikawa, 1972 and *E. longiporosa* Peréz-Iñigo, 1976), two species with 13 pairs of notogastral setae (*E. modesta* (Banks, 1904) and *E. prominens* Bayartogtokh et Aoki, 1998), two species bears 11 pairs of notogastral setae (*E. gessneri* Willmann, 1932 and *E. tavrui* Schweizer, 1956), and three species has only 10 pairs of notogastral setae (*E. bicuspidata* Hammer, 1958, *E. gracilis* Hammer, 1958 and *E. australis* Hammer, 1962). The number of notogastral setae of the two remaining species, *E. pellucida* and *E. nodifer*, was uncertain, because the authors did not show it in the original descriptions (Sellnick, 1931, Mihelčič, 1956).

The following species are doubtful or uncertain in placing them in the genus *Eporibatula*. As we mentioned above that *E. nodifer* described by Mihelčič (1956) shows only 9 pairs of notogastral setae, and the author did not show the humeral setae in the original description and figure. However, it should have at least 10 pairs of notogastral setae as usual as other oribatulid species. There is a great possibility that the humeral setae of Mihelčič's species are shorter and thinner than others, and it is obvious that if humeral setae were long or thick he must have show them. In this case, the Spanish species should belong to another genus. To determine the generic placement of this species the further detailed study on the type material is necessary. Recently, Pérez-Iñigo (1993) informed that the type specimen of Mihelčič's species was not existed in the collection of host museum. In this case neotype specimens should be designated and studied.

The most characters of *E. pellucida* described by Sellnick (1931) are uncertain to us, since his brief description and figure represent only the shape and outline of body, and the species has not been redescribed since it was discovered. It is quite impossible to determine the exact generic status of this species. Redescription of the type specimen is also necessary. Two other species, *E. gessneri* Willmann and *E. tavrui* Schweizer both bear 11 pairs of notogastral setae. According to the figures given by Willmann (1931) and Schweizer (1956), respectively, it seems that the shape and size of the humeral setae of their species are not different from the other notogastral setae, and in the original descriptions the authors did not mention about this character. If humeral setae normally developed in these species, they should not belong to the genus *Eporibatula*. Moreover, the character of ventral side of both the species is unknown and, therefore, it is impossible to determine the exact generic placement of these species. Further study on the type material is also necessary.

The South American species, *E. bicuspidata* described by Hammer (1958) obviously seems to be representative of other genus, since it bears the notogastral setae of the same size. Moreover, Coetzer (1967) created the genus *Gerloubia* and designated this species as the type-species of his genus.

According to the revised diagnosis above, the following nine species and the new species described in this paper should undoubtedly belong to the genus *Eporibatula*. They are:

- E. rauschenesis* (Sellnick, 1908)
- E. modesta* (Banks, 1904)
- E. venusta* (Berlese, 1908)
- E. gracilis* Hammer, 1958
- E. australis* Hammer, 1962
- E. sakamorii* (Aoki, 1970)
- E. tuberosa* Fujikawa, 1972
- E. longiporosa* Pérez-Iñigo, 1976
- E. prominens* Bayartogtokh et Aoki, 1998

In conclusion, the following key could be used for the determination of species of the genus *Eporibatula*. In this key we excluded the species which are doubtful or uncertain in placing in the genus *Eporibatula*.

#### Key to the known species of the genus *Eporibatula*

1. Notogaster with 10 pairs of setae ..... 8
  - Notogaster with more than 10 pairs of setae ..... 2
2. Notogaster with 14 pairs of setae ..... 5
  - Notogaster with 13 pairs of setae ..... 3
3. Lamellae wide, slightly widened toward anterior direction ..... *E. venusta* (Berlese, 1908) (Figs. 43 and 44)
  - Lamellae narrow, distinctly narrowed toward anterior direction or absent ..... 4
4. Sensillus capitate, lamellae absent, rostrum broadly rounded, dorsosejugal suture medially interrupted ..... *E. modesta* (Banks, 1904)
  - Sensillus clavate, lamellae well developed, rostrum distinctly projecting, dorsosejugal suture continuous ..... *E. prominens* Bayartogtokh et Aoki, 1998 (Figs. 24–34)
5. Sensillus capitate, rostrum prominent in dorsal view ..... *E. rauschenensis* (Sellnick, 1908)
  - Sensillus club-shaped, rostrum rounded in dorsal view ..... 6
6. Lamellae absent, posterior part of notogaster with four tubercles ..... *E. tuberosa* Fujikawa, 1972 (Figs. 11–23)
  - Lamellae present, posterior part of notogaster without tubercles ..... 7
7. Lamellae completely developed, prodorsal and notogastral setae barbed, areae porosae oval, dorsosejugal suture continuous ..... *E. sakamorii* (Aoki, 1970) (Figs. 35–42)
  - Lamellae incomplete, prodorsal and notogastral setae smooth, areae porosae elongated, very long, dorsosejugal suture interrupted ..... *E. longiporosa* Pérez-Iñigo, 1976
8. Lamellae wide, dorsosejugal suture weakly arched, median and posterior notogastral setae very short ..... *E. variabilis* sp. nov. (Figs. 1–10)
  - Lamellae narrow, dorsosejugal suture strongly arched, median and posterior notogastral setae long ..... 9
9. Relatively large species (body length about 440  $\mu$ m), prodorsum with longitudinal striations, rostral, lamellar and interlamellar setae conspicuously barbed ..... *E. australis* Hammer, 1962
  - Relatively small species (body length about 330  $\mu$ m), prodorsum smooth, without any striation, all prodorsal setae smooth ..... *E. gracilis* Hammer, 1958

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